Application of Solid Low Residue Diet Consisting Mainly of Elemental Diet in Colorectal Diseases

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Application of Solid Low Residue Diet Consisting Mainly of Elemental Diet in Colorectal Diseases

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Summary

An application of our modified elemental diet (ED) to Crohn's disease, low output fistula caused by anastomotic leak after colonic surgery, and pre- and postoperative use in colorectal surgery are presented. The modified ED, which had been devised to make the patients easier to take it orally, was prepared and cooked by adding ED with wheat flour in the ratio of 3 to 1. The clinical usefullness of the modified ED became obvious in the treatment of the above pathological conditions.

The limit in the use of this modified ED for preoperative colonic preparation are also discussed.

Introduction

Elemental diet (ED) is widely used for the treatment of inflammatory bowel diseases and colorectal surgery. In this paper, application of our modified ED to Crohn's disease, low output fistula caused by anastomotic leak after colonic surgery, and pre- and postoperative use in colorectal surgery are presented.

Materials and Methods

1. Preparation of modified ED:

Some solid or liquid foods mainly consisting of ED were devised to make the patient easier to take it by mouth[1]. In preparing solid foods, ED (Elental®, Azinomoto Co. Ltd., Japan) was mixed with wheat flour (Heart®, Nippon Flour Production Co. Ltd., Japan), in the ratio of 3 to 1, and some sweetners, butter and hen yolk were added to it. Then the mixture was cooked.

Key words: Elemental diet, Crohn's disease, Low output fistula, Colorectal cancer. Preoperative colonic preparation.

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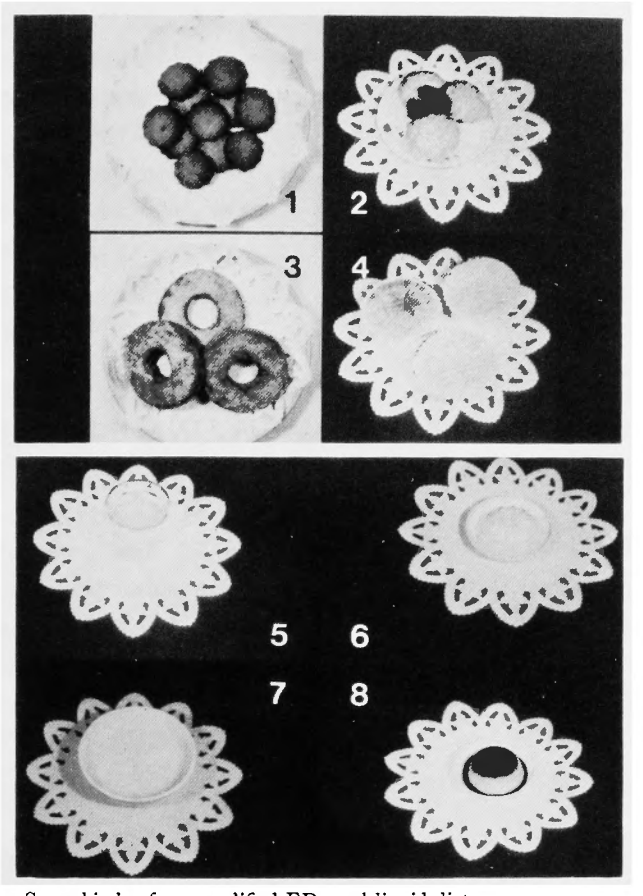

Figure. 1. Some kinds of our modified EDs and liquid diets.
1: cookies; 2: steamed cakes; 3: doughnuts; 4: hot cakes; 5: fruit juice; 6: blanc-mange; 7: potage; 8: pudding.

Liquid diets were prepared by adding ED to fruit-flavoured juice or clear soup. Some of these diets are exhibited in Figure 1.

2. Liking test:

Liking test for these foods was done in a total of 89 subjects (37 healthy volunteers; 52 hospitalized patients for abdominal surgery; 46 male, 43 female) to estimate a possibility of its clinical use.

3. Patients studied:

The subjects included in this study were 5 patients with Crohn's disease and 76 patients undergoing colorectal surgery.

4. Patients with Crohn's disease:

In patients with Crohn's disease, after their admission, they were checked their physical states, clinical, anthropometric and biochemical assessments, and received salicylasosulfapyridine (Salazopyrin®, Green Cross Pharmaceutical Co. Ltd., Japan) and metronidazole (Fragyl®,

Shionogi Pharmaceutical Co. Ltd., Japan). They took a total of 2000 kcal of the modified ED with liquid diets. Water, tea and candy were allowed at will. Ingestion period of the diet in 5 cases ranged from 16 to 160 days. As one of the parameters of disease improvement, Crohn's Disease Activity Index (CDAI), which had been proposed by BEST et al.[4] in 1976, was adopted.

5. Patients with colorectal surgery:

For pre- and postoperative patients with colorectal disease, the modified ED with or without liquid diets was administered and the usefulness of this food was evaluated from the standpoint of colonic preparation and bowel rest. No antibiotics were administered preoperatively.

6. Calculation of index of stenosis:

The index of stenosis was measured according to the method of MCADAMS et al.[13] from the findings of preoperative barium enema to estimate the degree of preoperative colorectal stricture due to the lesion.

7. Linear discriminant function for colonic preparation:

A linear discriminant function was devised to seek the requisite pericd of preoperative ingestion of the modified ED with or without liquid diet to get an ideal colonic preparation.

Results

1. Liking test:

Sixty-three of 89 subjects (70.1%) well tolerated the modified ED.

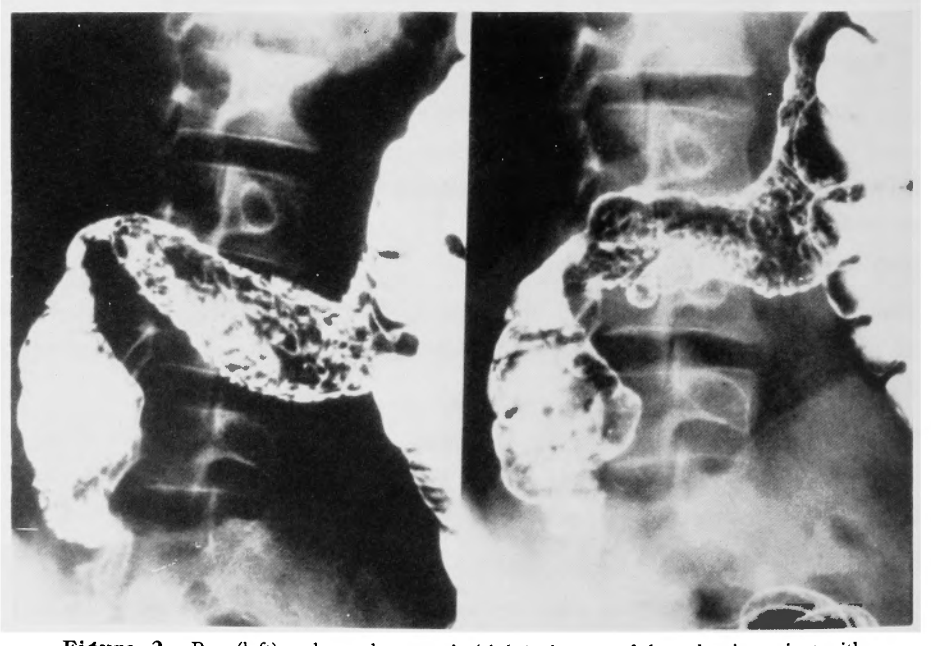

Figure. 2. Pre- (left) and posttherapeutic (right) pictures of the colon in patient with Crohn's disease.

2. The effect of the modified ED on patients with Crohn's disease:

Five patients with this disease were administered the modified ED as a part of the conservative treatments. One of our cases who responded well to it is as follows.

The patient was a 14-year-old female and admitted to our department with a chief complaint of perianal pain. Three years before her admission, she had been operated on for anal fistula. After the operation, she had received some remedies for Crohn's disease because of a fever and lower abdominal pain. On her admission, she had a recurred anal fistula and her CDAI value amounted to 228 (normal range$\leqq$150). The patient stopped normal diet and received the modified ED with liquid diets in addition to some medical treatments. Figure 2 shows the pre- and posttherapeutic pictures of the colon. On rentgenogram, her remission was not so remarkable. Her clinical course is shown in Figure 3, and her CDAI value gradually diminished, and amounted to 121 after 3 months, 88 after 5 months, respectively. During this period, her weight gain was as much as 13 kg.

Similar results were obtained in the remainders.

3. The effect of the modified ED on patients with low output fistula:

The modified ED was applied to 4 patients with low output fistula. The clinical course in one of these cases is as follows.

The patient was a 47-year-old man and underwent anterior resection for his rectal cancer. His postoperative course was uneventful and on the 8th postoperative day, he was given normal postoperative diet. On the next day, fecal discharge was recognized through the drain which had been put near the anastomosis. Slight leucocytosis was observed, and a minor leak was suspected. He was given the modified ED with liquid diets alone. The discharge gradually diminished, and became minimum one week later. After all, this untoward complication spontaneously subsided. His clinical course is summarized in Figure 4.

We experienced the other 3 cases with low putput fistula and could obtain good results by the

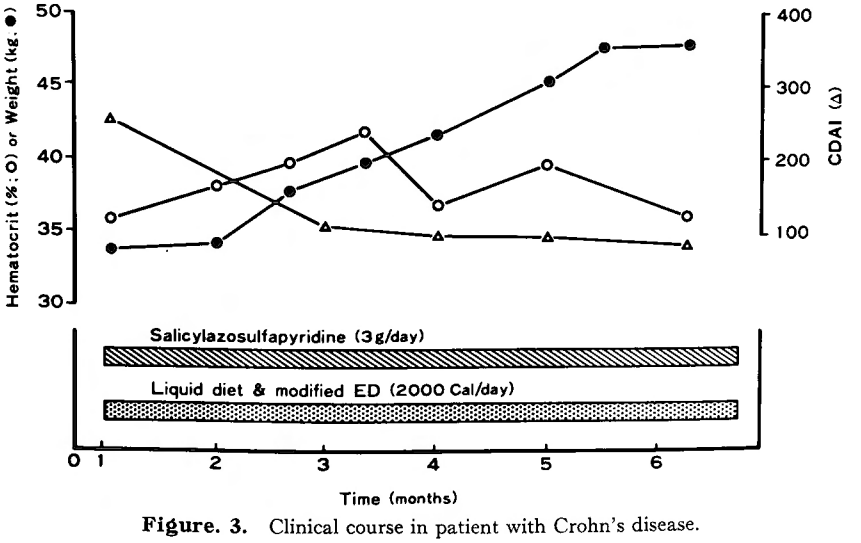

Figure. 3. Clinical course in patient with Crohn's disease.

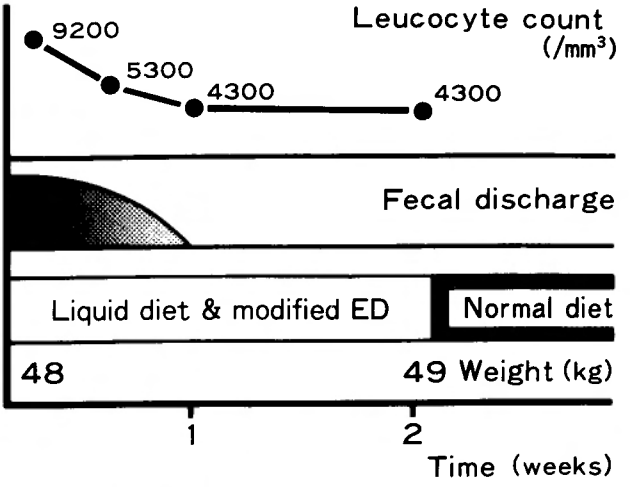

Figure. 4. Clinical course in patient with low output fistula.

administration of the modified ED[2].

4. The use of modified ED for preoperative colonic preparation:

Seventy-six patients were included in this study. Our standard plan of preoperative colonic preparation is as follows. Patients, who were scheduled to be operated on for their colorectal disease, received laxative, i.e., 250 ml of 34% magnesium citrate solution (Magcorol®, Horii Pharmaceutical Co. Ltd., Japan), 4 days before operation and were followed by ingestion of 2000 kcal of the modified ED and liquid diet. On the previous night of operation, they received the second administration of the same laxative. The outline of the standard procedure is shown in Figure 5.

5. Postoperative use of the modified ED in colorectal surgery:

Postoperatively, the patients were maintained with total parenteral nutrition (TPN) for the first 1 to 2 weeks, and thereafter, followed by the administration of the modified ED for the purpose of decreasing the intraluminal pressure of the anastomosed intestine, nutritional support,

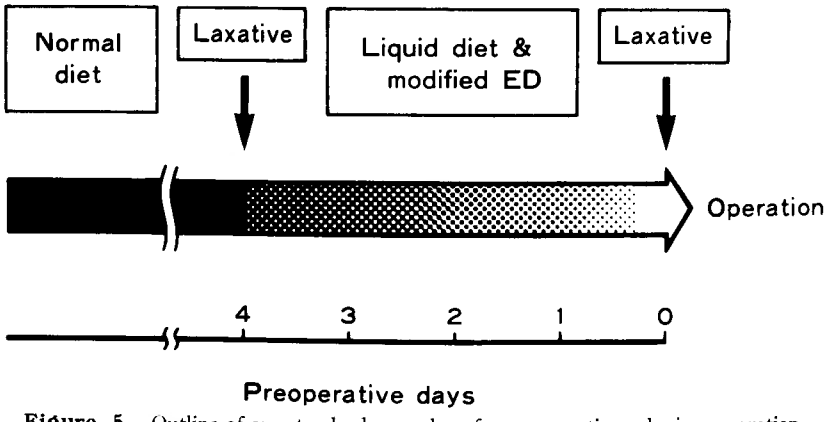

Figure. 5. Outline of our standard procedure for preoperative colonic preparation.

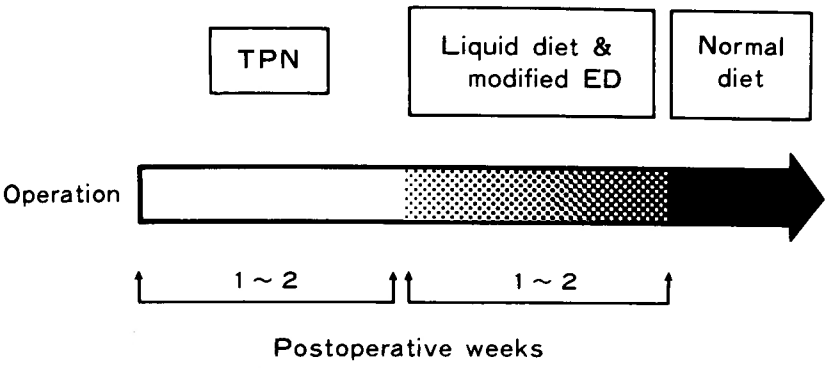

Figure. 6. Outline of our standard course for postoperative nutritional support.

and provision for the initiation of normal postoperative diet. The outline of this course is shown in Figure 6.

6. Retrospective study of preoperative colonic preparation:

Preoperative colonic preparation with the modified ED was sometimes unsatisfactory because stenosis of the colon or rectum casued by the lesion was too intense. Hence, the result of colonic preparation in 76 patients was plotted retrospectively in the relation between each index of stenosis (y) and ingestion period of the modified ED (x). In the Figure 7, an open circle shows the case in whom a good preparation has been obtained, and a closed one a poor. On the basis of these data, a "linear discriminant function", $y=4.2x+52.0$, was obtained to seek the requisite period of the ingestion of the modified ED to get an ideal colonic preparation by calculating the index of stenosis.

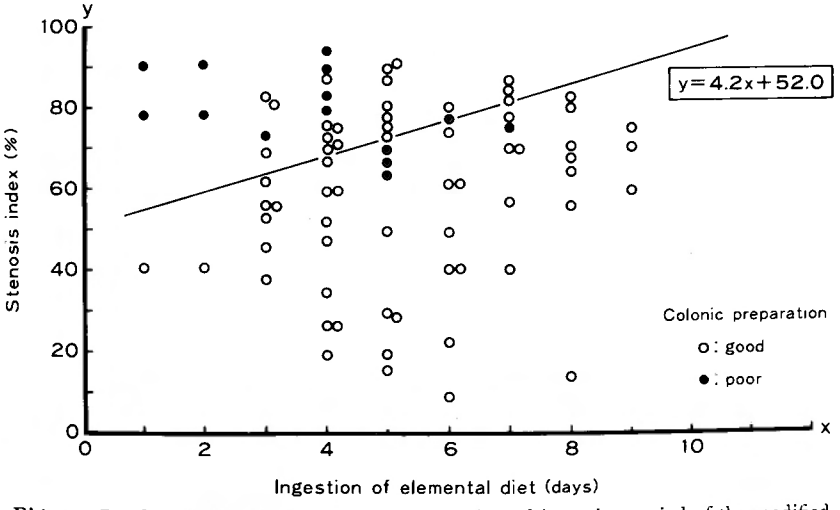

Figure. 7. Correlation between index of stenosis and ingestion period of the modified ED in colonic preparation.

Discussion

ED stems from space diet[26] and is applied for a wide variety of clinical situations in which it has sometimes proven therapeutics. However, poor palatability of the diet makes the patients difficult to sustain daily oral intake[16]. This unpalatability results from the organic taste and smell of the amino acid mixtures and some of the vitamins contained in it, and flavoring agents are often added to ED when patients try oral intake. Such an unpalatability sometimes leads to use TPN in preoperative bowel preparation, inflammatory bowel disease, enteral fistula, postoperative state and other pathological conditions. However, complication of catheter insertion, great vein thrombosis, septic and metabolic complications are encountered in a few patients with TPN[19]. This is the reason why we devised low residue diet by mixing ED with small amount (25%) of wheat flour to make patients easier to take by mouth. Our liking test tried in 89 subjects shows possibility for clinical use of this modified ED, solid low residue diet.

Medical treatments for Crohn's disease are very difficult. Though sulfasalazine and predonisone have generally been accepted as the standard medical treatment for this pathological condition, some cases are resistant to these remedies. On the other hand, sugery often results in a good outcome, but recurrence of active disease is not so uncommon[8]. Nutritional treatment by TPN[11,12,14,16,21,23] or ED[3,10,17], or a combination of both is reported to be effective in the disease. ED is well absorbed by the small bowel of patients with Crohn's disease, and may bring about a remission. Our diet is supposed to play one of the important roles in the remission of the disease activity, and later in the nutritional supplement.

ED has been most successful in the management of low output fistula[2,20,22]. BURY[5] reported that an overall spontaneous closure was achieved in 70% of such patients. Being predigested, ED does not bring forth copious amount of digestive juices, and containing no wastes while being completely absorbable, there is minimal fecal matter to pass over the fistula[25]. By allowing the intestine and fistula to rest, ED provides needed nutrition and produces the favorable outcome[6]. In this sense, oral modified ED as well as TPN makes a contribution to the healing of low output fistula.

Although many authors agree that much fecal mass in the colon and peritoneal soilage with colonic contents during operation are sometimes followed by increase of postoperative complications[9,15,18], the best method of preparing the colon for surgery still remains unsolved. There has been controversy concerning ED administration in the preoperative bowel preparation, because oral ED failed to comfirm the remarkable reductions in bacterial concentrations[7]. Since experimental and clinical evidence indicates that suture line recurrence of tumor is more common when antibiotics are used to prepare the bowel for surgery[24], oral modified ED plus liquid diet without any antibiotics was carried out in this study. However, in patients with intense stenosis of the colon or rectum due to the lesion, colonic preparation with the modified ED was sometimes unsatisfactory. To solve this problem, we devised a "linear discriminant function" to perceive the requisite period to take this food in order to get an ideal colonic preparation only by calculating the preoperative index of stenosis. The function also shows that we must

abandon this diet and adopt the other colonic preparation when the index is too large.

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和文抄録

Elemental diet を主体とした低残渣食の結腸・直腸疾患への応用

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私達が工夫した elemental diet (ED) を主体とした低残渣食をクローン病，結腸手術後の縫合不全に起因する low output fistula，ならびに結腸・直腸疾患の術前準備と術後栄養に応用した．この低残渣食はＥＤの有する特有の臭気，味からくる経口摂取の困難性を打開するために工夫されたもので，ED 3 に対し，小麦粉１の割合で混合し，これに種々の甘味料，バター，フレーバーを添加し，クッキー，ドーナツ，プリンなどに加工した．これらの食品を上記の病態や疾患を有する症例に１日 2000 kcal 経口的に投与し，それぞれ所期の目的を達した．しかし病変による強度の狭窄を示す結腸・直腸疾患症例では，colonic preparation を目的にこの低残渣食を術前に投与しても無効なことが多かった．このことから，79症例の術前注腸造影像より算出した狭窄指数と preparation の結果との retrospective な検討により，個々の症例の狭窄度に応じた本低残渣食の術前投与期間を定められるよう線形判別関数を設定した．